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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Date February 19, 2008

In re the Application of

Susumu NODA et al.

Group Art Unit: 2828

Application No.: 10/591,035

Examiner: S. HAGAN

Filed: August 29, 2006

Docket No.: 128698

For: SURFACE-EMITTING LASER LIGHT SOURCE USING TWO-DIMENSIONAL PHOTONIC CRYSTAL

**LARGE ENTITY PETITION FOR 1<sup>st</sup> - 3<sup>rd</sup> EXTENSION  
OF TIME UNDER 37 C.F.R. §1.136(a) AND  
TRANSMITTAL OF FEE UNDER 37 C.F.R. §1.17**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Transmitted herewith is a response to the outstanding Official Action in the above-identified patent application. The shortened statutory period having expired January 18, 2008, an extension of time for a period of 1 month is hereby requested. Attached hereto is our Check No. 202538 in the amount of \$120.00 in payment for:

Extension fee for response within first month pursuant to §1.136(a) (\$120.00)  
 Extension fee for response within second month pursuant to §1.136(a) (\$460.00)  
 Extension fee for response within third or subsequent month pursuant to §1.136(a) (\$1050.00)

The Commissioner is hereby authorized to charge any additional fee or credit any overpayment associated with this communication to Deposit Account No. 15-0461.

Respectfully submitted,

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**DEPOSIT ACCOUNT USE  
AUTHORIZATION**  
Please grant any extension  
necessary for entry;  
Charge any fee due to our  
Deposit Account No. 15-0461



[0022]

(First embodiment, see Fig. 1) In a first embodiment of a two-dimensional photonic crystal surface-emitting laser according to this invention, as a cross section of the main parts is shown in Fig. 1, the photonic crystal periodic structure 21a has a triangular sectional shape in a direction perpendicular to the crystal surface, and the periodic structure 21a is formed in the lower clad layer 12. Except for those features, the first embodiment has the same basic construction as the two-dimensional photonic crystal surface-emitting laser 10 of Fig. 8. The first embodiment is manufactured using materials of the same kind and causes surface-emission due to the same resonant action.

[0023]

The periodic structure 21 shown in Fig. 8 has a cylindrical shape, an elliptical shape, or a square-rod shape. The periodic structure 21a of the first embodiment has a conical shape, elliptical-cone shape, or square-pyramid shape, each corresponding to those shapes of Fig. 8. The first embodiment causes a secondary diffraction like the conventional periodic structure 21. However, it prevents a primary diffracted light L2 in a direction toward the base of the periodic structure 21 (triangular shape), while emitting more primary diffracted light L1 in a direction toward the vertex of the triangular shape. The utilization efficiency of lights is thus improved.

[0032]

After that, the lower clad layer 12b is inverted (see Fig. 5(A)) and the lower clad layer 12b is welded onto the lower clad layer 12a laminated on the substrate 11 (see Fig. 5(B)). The completed state is shown in Fig. 5(C). The active layer 13 and the upper clad layer 14 are beforehand laminated on the lower clad layer 12b. Subsequently, as shown in Fig. 8, the lower electrode 16 is provided on the lower surface of the substrate 11, and the upper electrode 17 is provided on the upper surface of the upper clad layer 14.



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**AMENDMENT**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

In reply to the October 18, 2007 Office Action, and in consideration of the attached  
Petition for Extension of Time, please consider the following:

**Amendments to the Specification; and**

**Remarks.**